CO-OPERATION

To all Members of the College of Agriculture.

In all of the internal relationships of members of this staff, as well in technical work as in business matters, I would request fullest possible co-operation in the practical application of the Golden Rule. It is the only means ever devised whereby human relationships may yield permanent peace, solid contentment, or enduring happiness—and consequent effective co-operation. The innumerable petty difficulties and potential causes of friction are overcome and smcothed away, if this Rule is kept clearly in the foreground as a guiding principle—do to others as you would have them do to you. Friction between members of a large staff, where work is so extensively interlocking as it is here, means definite loss to the University, loss in time and loss in results. Smooth and effective co-operation means great results—constructive results—and breeds great hope in all of us. Common courtesy pays tremendous dividends. The constructive criticism necessary to improve conditions at many points can just as easily be clothed in the most impeccable courtesy and kindness—in this guise it may make action attractive when otherwise it might merely produce resentment.

Another common precept, corollary to the above, is worthy of consideration in this connection—"People who live in glass houses should not throw stones". Some of the most difficult problems in the practical operations of any group of human beings arise from disregard of this axiomatic "first aid to peace". We are *all* human and fallible and prone to err, and we had better always remember this, and keep on hand ready for instant use in the many cases of emergency that come up, a generous supply of charity for others.

On the whole we have had a splendid community spirit at Los Baños, and there has been a constant display of fine team work in many connections. In this direction certainly lie the greatest hopes for the development here of a productive and effective College. And naturally this supreme objective is of infinitely greater importance than any mere personal interests —or feelings.

"All hands to the ropes!
All together now! Heave Ho!"

C. F. Baker (Dated May, 11, 1925)
Dean.

THE MEASURE OF A MAN

Not—
"How did he die?"
But—
"How did he live?"
Not—
"What did he gain?"
But—
"What did he give?"
These are the units
To measure the worth
Of a man, as a man.
Regardless of birth!

Not—
"What was his station?"
But—
"Had he a heart?"
And—
"How did he play
His God-given part?
Was he ever ready
With words o' good cheer
To bring back a smile,
To banish a tear?"

Not—
"What was his church?"
Nor—
"What was his creed?"
But—
"Had he befriended
Those really in need?"
Not—
What did the sketch
In the newspaper say?"
But—
"How many were sorry
When he passed away?"

—WALLACE GALLAGHER.

The philosopher should be a man willing to listen to every suggestion but determined to judge for himself. He should not be biassed by appearances; have no favorite hypothesis; be of no school; and in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary subject. If to these qualities be added industry, he may indeed hope to walk within the veil of the temple of nature.

—MICHAEL FARADAY.

A GRAVITY GATE, OR A SIMPLE SELF-CLOSING GATE[1]

ALEXANDER GORDON
Of the Department of Agricultural Engineering

WITH SIX TEXT FIGURES

Daily observation makes it unnecessary to show the need for a simple self-closing gate in the Philippine Islands. It is not uncommon to find fenced farmsteads with gates thereon. The purpose, however, of fencing is generally defeated because apparently the farmers, or others for that matter, do not have the time or take the trouble to close the gates. It would seem that the only way to have the gate fulfill its purpose is to use one with some simple device that will automatically close it when it is opened. With this in mind, the writer devised a type of gate that will automatically close. The simple gravity gate has no hinges or parts that will get out of place or out of condition.

THE CONSTRUCTION OF THE GATE

The construction of this gravity gate is very simple. A frame gate, as it is commonly constructed, is built. To this gate is attached a pivot piece, which serves as the hinge and is placed at the side on which the gate must swing. (See fig. 1).

The pivot piece is inclined at an angle of from five to ten degrees (5°-10°) on the vertical. The angle of inclination will depend upon the speed of closing desired. Furthermore, this angle will be limited by space. The

[1] Experiment Station contribution No. 537. Received for publication May 24, 1928.

Mr. Pflueger of Philippine Bureau of Forestry gives his opinion of the gravity gate in the following letter:

School of Forestry
Agricultural College
Laguna, P. I.
May 10, 1928.

Dr. Alexander Gordon,
Los Baños Agricultural College,
Laguna, P. I.

Dear Dr. Gordon:

I have seen several types of self-closing gates in the United States, but in my estimation the gravity gate you have shown me is one of the simplest and most efficient that I have ever seen. The fact that it requires no patent devices for closing is, in my opinion, its strongest point.

I am of the opinion that it will be of use in the Philippine Islands.

Very respectfully,

O. W. Pflueger
Forester
Chief, Division of Investigation.

farther out the inclination, the narrower the space becomes at the top of the gate. Because of this, it is desirable to have the pivot piece incline as little as possible. (Note the inclination of the pivot pieces in fig. 2 and 3).

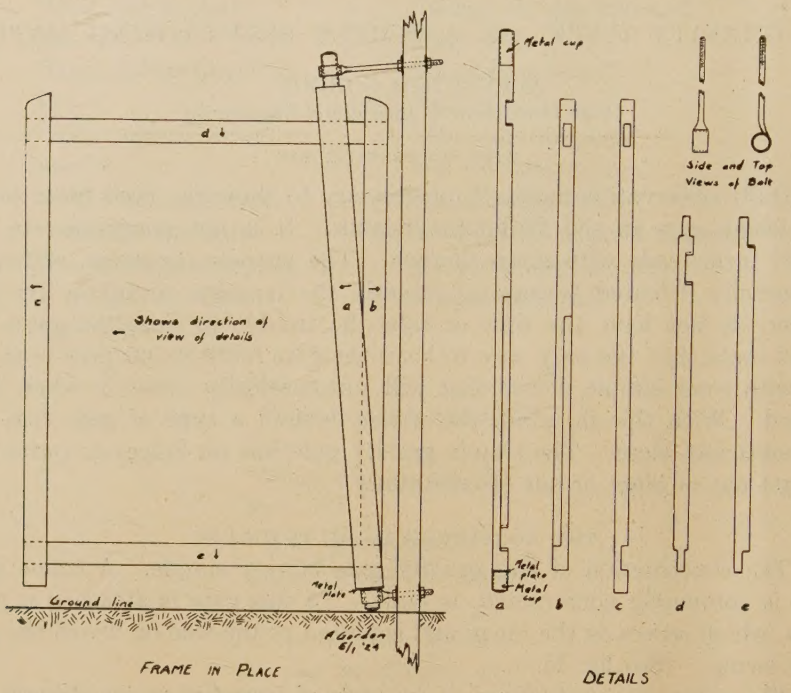

Fig. 1.—Plan of framework of the gravity gate. Note the method of hanging the gate.

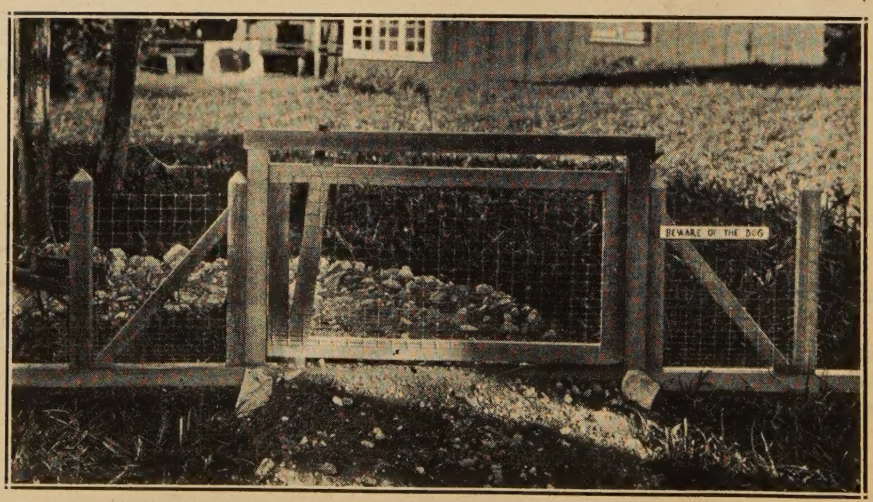

Fig. 2.—Gravity gate of wood, closed. Note the method of hanging the gate.

MATERIALS FOR CONSTRUCTION

This gravity gate may be made of any available material. Bamboo, wood, iron pipes, etc., may be used for the frame. Figure 2 shows a gate of wood; figures 3 and 4 show a gate of bamboo. In figure 4 the gate is shown open. (Note how the gate swings up when opened).

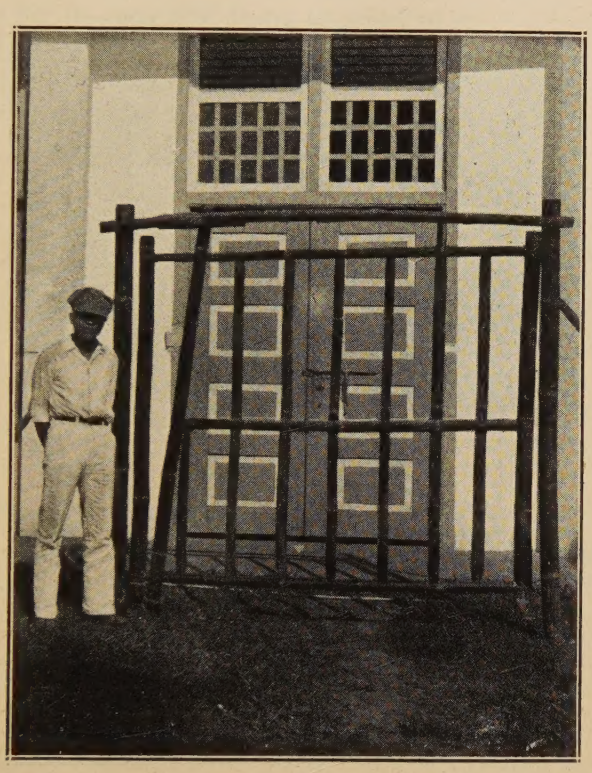

Fig. 3.—A model of the gravity gate made of bamboo, closed. Horizontal pieces of the gate are inserted through the pivot piece.

METHODS OF HANGING THE GATE

The method of hanging the gate hardly matters. In figure 2 the lower end of the pivot piece is in a socket in the ground, and the upper end moves in a socket in the tie beam of the gate.

Figures 3 and 4 show the bamboo gate with the pivot piece attached at the bottom in a bamboo socket while at the top it is attached by a hole in a bamboo joint spliced to the tie beam.

Figure 1 shows a method for attaching a gate quite different from that shown in figures 2 and 3.

METHODS OF FASTENING GATE

There are a number of ways of fastening this gate. If the gate is to be made to swing in and out, then the latch must permit the gate to swing by. But, if it is desired that the gate swing on one side only, then any latch will do, and the gate is hindered from swinging by. There are many patent

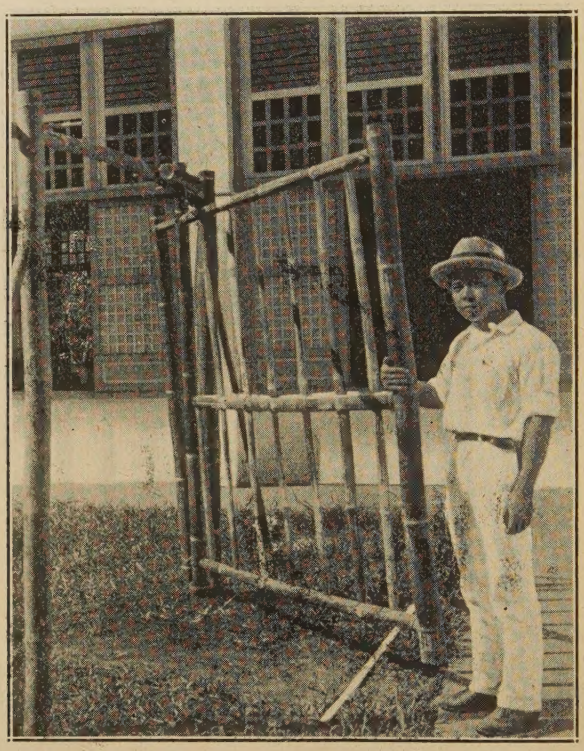

Fig. 4.—The bamboo gravity gate, open. Note method of hanging gate at the top; pivot piece is inserted through a bamboo joint spliced to the cross beam. Note also how gate swings up.

devices of this kind, but for a swinging gate, the one diagrammatically shown in figure 5, is, in the writer's opinion, the one best suited; it can easily be made by any one.

This latch may be made of wood or iron. In figure 5, the lock piece *a* is inserted into *b* which is fastened to the gate post, while *c* is fastened to the gate. As the gate swings by, *a* slides on *c* jumping over the gap if the gate swings fast, and catching if the gate swings slowly.

PRINCIPLE OF THE GATE

In figure 6, let the plane determined by the posts (and tie beam if any) be PQ. PQ, therefore, is perpendicular to the ground plane, being determined by the posts.

Let AB be the plane of the gate. XY is the pivot piece, and lies wholly in the plane AB, being a part of the gate.

XY also lies in plane PQ, being attached to it.

Let n be the intersection of AB with the ground plane.

Divide AB into triangles 1 and 2, and rectangle 3; and let *c. g. 1*, *c. g. 2*, and *c. g. 3* be their respective centers of gravity.

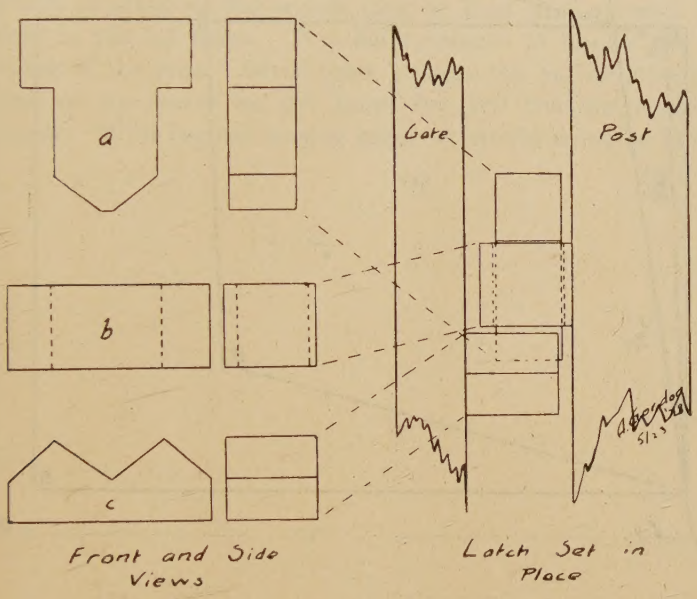

Fig. 5.—Diagrammatic drawing of a latch for a swinging gate.

When the gate is at rest, in a stable state, the lines of the force of gravity on the centers of gravity will cut the intersection n of AB and the ground plane at k, l, and m. Therefore, the lines of the force of gravity on *c. g. 1*, *c. g. 2* and *c. g. 3* must be contained in the plane AB.

The lines of the force of gravity on *c. g. 1*, *c. g. 2*, and *c. g. 3* and XY are coplanar. Since the lines of the force of gravity are perpendicular to the ground plane, then AB which contains them must be perpendicular to the ground plane also. But PQ is also perpendicular to the ground plane and contains XY; therefore AB and PQ is but one plane. Under this condition, the gate is closed.

Now, let AB swing on XY to any position $A'B'$. Let the intersection of $A'B'$ and the ground plane be n'. Let the corresponding centers of gravity move to *c'.g'. 1*, *c'.g'. 2*, and *c'.g'. 3*.

In the $A'B'$ position, the lines of the force of gravity on the centers of gravity will not fall on the intersection n' of $A'B'$ and the ground plane, but they will cut the ground plane at k',l', and m', respectively. Thus, the force of gravity on $c'.g'.\ 1$ creates a positive moment, and on $c'.g'.\ 2$ and $c'.g'.\ 3$ negative moments.

The moments of the force of gravity on $c'.g'.\ 1$ and $c'.g'.\ 2$ will tend to cancel each other. This being the case, the moment due to the force of

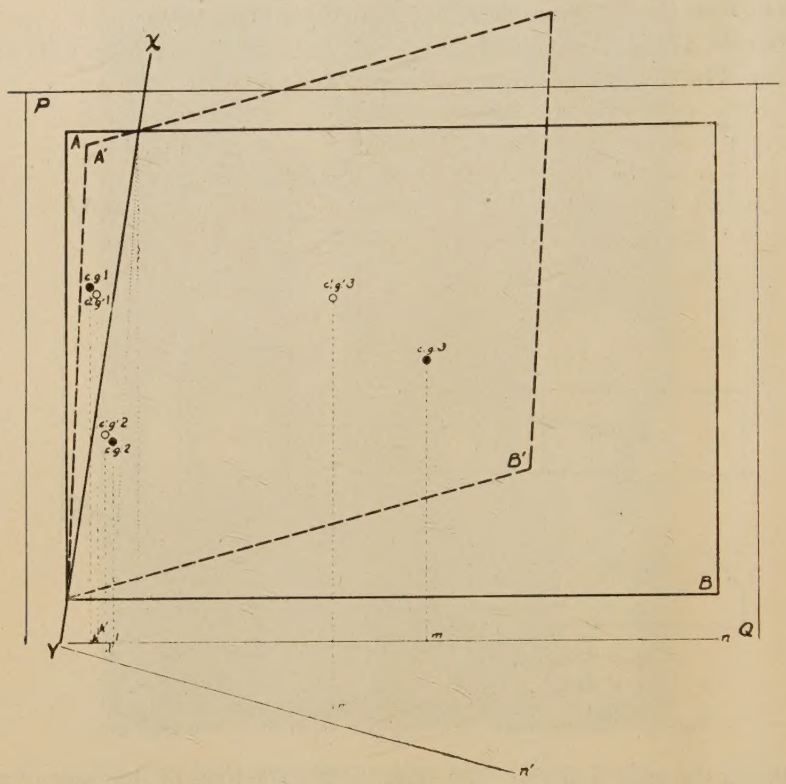

Fig. 6.—A diagram showing the principle of the gravity gate.

gravity on $c'.g'.\ 3$ will be the only effective moment in bringing down $c'.g'.\ 3$ to its original position $c.g.\ 3$. The same moment is the one that brings back the gate to close. Owing to the momentum gathered by the gate on its descent from one side it will swing up on the other side, and vice versa until it finally rests at the original position, AB.

This analysis shows that:

1. The heavier the gate, pivot inclination constant, the faster the gate will swing.

2. The larger the angle of inclination of the pivot piece, all other parts remaining the same, the faster the gate will swing.

CONCLUSION

The writer believes that he has found a gate that will serve a need of long standing on Philippine farms. This gravity gate, because of its simple construction, with no complicated device to get out of order, and easily set up, should have various uses. This gate may be from the heaviest to the lightest type. It may be used for ranches, pens, and for other animal projects that use fencing. The gate is easily adaptable to home use; in short, it is an all-purpose gate that may be used in any place that demands a gate.

As a sanitary measure this gate should be a boon. Hogs, fowls and other animals so often on the streets may be kept shut up with this self-closing gate in the lot fence. This daily menace to health can thus be made a thing of the past. Often these animals are on the streets not because there are no fences on the home lot, but because the gate is not always closed. With the self-closing gate,—it would never be left open.

PROXIMATE CHEMICAL ANALYSIS OF SOME PHILIPPINE SHELLFISH[1]

SEVERINO B. ETORMA

WITH ONE PLATE

INTRODUCTION

There are relatively few towns in the Philippines where shellfish, either salt or fresh water species, are not used as food. There seems to be no good reason for the study of their food value having been overlooked or neglected. The fact that they are in abundance in the Islands probably accounts for the Filipino's attitude of just appropriating what Nature provides regardless of whether or not it is rich in food constituents. This practice may explain the lack of literature on the composition of the shellfish. As years go on and population increases, Filipinos will realize the importance of preserving and propagating those species of shellfish which are of the greatest economic value. In fact a beginning is now manifest in thickly populated regions, such as localities near Manila. Oysters are cultivated in river mouths around Manila, and in the tide flats of Manila Bay, especially in Malabon, Rizal.

An investigation on the food value of shellfish would be of great help to the people using them as food, and also to those who will engage in shellfish industry as they could select species to propagate according to their merits. Had there been information of this kind in the past probably those species of shellfish which are of high nutritive value would have been propagated on a commercial scale or at least protected from their natural enemies.

A glance at the United States oyster business will give a hint of how profitable a shellfish industry may be. Stiles (1910) reports that in 1902 there were 25 million bushels of oysters marketed in the United States, valued at 20 million dollars. In New York City, alone, 6 million bushels of oysters are marketed annually costing 7 million dollars and 45,000 bushels of clams at 90 thousand dollars.

The object of the present work was to determine the proximate chemical composition of some Philippine shellfish with a view to understanding their comparative food value.

[1] Thesis presented for graduation, 1927, with the degree of Bachelor of Science in Agriculture from the College of Agriculture No. 264; Experiment Station contribution No. 538. Prepared in the Department of Agricultural Chemistry under the direction of Dr. F. O. Santos.

MATERIALS AND METHODS

The following are the materials analyzed. They were identified by Dr. Leopoldo Faustino of the Bureau of Science.

One species of oyster, talaba (*Ostrea orientalis* Chemnitz) was obtained from Malabon, Rizal; one species of crab, alimasag (unidentified), was bought in Calamba, Laguna; (*Palaemon sundaicus* Heller (Herre)) and (*Ampullaria vittata* Reeve) were secured in Los Baños, Laguna, and the rest in Unisan, Tayabas. Altogether, there were 28 species of shellfish used in this study. Owing to the remoteness of the sources of materials from the College, the effect of the strong typhoon on November 5, 1926 on the sources of supply, and the lack of laboratory facilities, relatively very few species were available for analysis.

Biñga (*Melo aethiopica* Linn. Var. *Broderpii* Gray) is a salt-water-loving shellfish. It lives among rocks and corals in water at least a meter deep at low tide. The color varies from light to dark brown. Ordinarily it weighs about one kilogram. It is rarely found in the market because it is difficult to collect. Sometimes some are gathered and sold to Chinese who offer any reasonable price for them. Very few Filipinos eat this shellfish, probably because of its scarcity. The sample was obtained from Unisan, Tayabas.

Balakwit (*Strombus canarium* Linn.) is common in Manila and Tayabas bays. It was claimed by Seale (1912) that there are at least thirty species of the Strombus shells in the Philippines. Although the flesh is only ten per cent of the total weight of the organism, yet the animal is able to swim at the surface of the water. It is not uncommon to see a group of balakwits swimming along the coast of Tayabas Bay. It is a very good food. According to Seale (1912), it is sold in Manila at 6 centavos a kilogram. The specimen used in this investigation was collected in Unisan, Tayabas.

Patanang (*Murex ramosus* Linn.) is found in considerable quantities among reefs and rocks on shallow shores of Tayabas Bay. At first sight one would think that the shell would be difficult to handle, but upon close observation it is found that the spines are harmless. It has a black shell. It makes a good soup and sells at 8 centavos a kilogram. The sample used in this investigation was collected at Unisan, Tayabas.

Susóng dagat (*Cerithium vertagus* Linn.) has a very hard horny shell assuming a variety of color patterns on a white background. The season for collecting this shell is in August during very low tides. This crustacean loves deep water with a sandy bottom which is exposed only at this time of the year. It is found in Tayabas Bay. Owing to the seasonal appearance of this shell, it commands a high price. It sells at 15 centavos a kilogram. The sample was obtained from Unisan, Tayabas.

Talitap-ong (*Murex capucinus* Lk.) is plentiful in marshes under mangrove trees (*Rhizophora* spp.). They can be collected from muddy brooks in which the water is brackish. Decaying logs submerged in water

harbor many of these shellfish. It is interesting to note that they can live out of their natural habitat for at least a week. The writer succeeded in keeping his extra specimens alive for ten days in the laboratory in a basket woven out of fresh leaves of buri (*Corpyha alata* Roxb.). At the end of this time some were thrown away while yet alive. Probably, they would live still longer. Many tenants in the coconut regions bordering marshy patches collect these shellfish on Sundays and holidays. They form an important part of the diet of the laboring class in these localities. They sell at 7 centavos a kilogram. This sample came from Unisan, Tayabas.

Cohol (*Ampullaris vittata* Reeve) is found in abundance in Laguna de Bay; it is also found in fresh water ponds, creeks, and rice paddies. It approaches the shape of a Venus clam. It has a thin green shell. It is of little importance as food except in some places as Lucban, Tayabas, where it is collected from rice paddies and eaten cooked. It is more commonly used as a poultry feed than as a food. It sells at 5 centavos a hundred around Laguna de Bay. The sample analyzed was collected at Los Baños, Laguna.

Taktakin (unidentified), (plate 1; fig. c) is very common along the coast of Tayabas Bay in shallow water with rocky bottom. It has a conical shell with blunt apex and hemispherical operculum. It measures ordinarily three centimeters on the longest diameter at the longest diameter of the operculum. It makes a delicious soup. It sells at 10 centavos a kilogram. It is plentiful along the shores of Tayabas Bay in Unisan, Tayabas, where the material used in this study was collected.

Bitubituin (unidentified), (plate 1; fig. e), is a Venus clam. It has a white shell and yellow flat operculum. It measures two centimeters on the operculum. It is found in large quantities on sandy beaches submerged at high tide. It is highly regarded as a food and sells at 7 centavos a kilogram in Unisan, Tayabas, where the sample was collected.

Tibangca (*Nerita*) is found clinging on stones in brackish water along river banks which are submerged at high tide. It is green and the shell when treated with a weak acid (acetic) reveals a variety of nice colorations. In regions where this shell is abundant it is usually considered a good diet for people who are sick. This shell sells at 6 centavos a kilogram in Unisan, Tayabas, where the sample was obtained.

Susóng tabang (unidentified), (plate 1; fig. b), is a fresh water black horn shell. It is plentiful in shallow water of creeks and ponds. It is regarded as a good food. It combines well with a species of edible fern, paco (*Pteris qudriaurita*) and coconut milk. It is very popular among poultry raisers, particularly duck raisers, because it provides both feed and grit. It sells at 6 centavos a kilogram. The sample studied came from Unisan, Tayabas.

Caligay (unidentified), (plate 1; fig. g), is found in abundance along the coast of Tayabas Bay in shallow water with sandy bottom. It is collected

by raking on the sand with the fingers at low tide. As it is small it takes time to separate the flesh from the shell. For this reason in Manila and probably in other places it is eaten more between meals than at meal time. The Manilan sits down with a plate of boiled caligay and patiently draws one by one the snails from the shell with the aid of a pin. It sells at 7 centavos a kilogram.

Tapalang (*Cyrena gigantea* Prime) is found living in the mud at a depth of about 5 centimeters along the banks of rivers and brooks with brackish water. This is one of the large clams. It is black and measures, ordinarily, about 10 centimeters on its longest diameter. It is collected by scratching the mud with a dull bolo; the chances are, if it is plentiful, that any hard object that the bolo encounters is tapalang. It makes an excellent soup. Besides being used as food, the shell is used as a source of lime for the sugar industry and to mix with *buyo*. It sells at 8 centavos a dozen. The material was obtained in Unisan, Tayabas.

Barong (*Pinna virtaga* Menke) abounds on sandy shores exposed at low tide. The pointed end of the shell is buried while the broad flat end barely reaches the surface of the sand. Walking barefooted, except with care, on places where they are abundant is not safe. The broad end is sharp and can make a deep cut on the foot, if stepped on. A specimen measuring 50 centimeters long is not unusual. The Bureau of Science (Mining Division) has a fossil of this shell which measures about 40 centimeters in length. People along the coast of Tayabas Bay know how to prepare a very palatable dish out of this shellfish. It sells at 10 centavos a kilogram.

Manlit (*Tridacna cumingii* Reeve) is found among rocks and reefs in salt water. They vary in size, weighing from several hundred grams to 30 kilograms. Fossils of large specimens may be seen where holy water is placed near the doors of the old churches in some towns of Tayabas. Collecting these shellfish is rather risky. They are located in deep water and are secured only by diving. Besides the danger from attack by sharks, there is also danger in handling the shells. The shell is attached firmly to a piece of rock and the valves are oftentimes open ready for the prey that may come along; when disturbed the shells immediately close and remain so until the prey is digested. But, when a person dives and accidentally puts his leg or hand between the valves, instantly he will be cut, the seriousness of which will depend upon the strength and sharpness of the edges of the valves. The gripping is not due to aggressiveness on the part of the animal but to its fright when disturbed by large objects. Very few people eat manlit, owing probably to the difficulty involved in getting it and the coarseness and the toughness of the flesh. The shells are gathered for decorating purposes. This shellfish is rarely found in the markets.

Talaba (*Ostrea orientalis* Chemnitz) is found in practically every island in the Philippines. It is an important source of food among Filipinos; so

important that it is cultivated in Malabon and in other tide flats of Manila Bay. Seale (1912) reports that private claims on oyster beds are watched by hired watchmen to prevent thieving. Along the banks of rivers flowing into Tayabas Bay these oysters are also found. In Manila they sell at 20 to 50 centavos a liter (shelled) (Seale (1912). The sample used in this study was from Malabon.

Capios (unidentified), (plate 1; fig. i), is found living in clusters attached to the roots of mangroves. A portion of a root 50 centimeters long may harbor as many as 200 individuals. The sparse population in Tayabas is the probable reason for this oyster's being neglected. It offers a wholesome food, whether eaten raw or cooked. It makes an excellent chowder. It sells at 3 centavos a kilogram. The sample was collected in Unisan, Tayabas.

Litog (*Arca granosa* Linn.) has practically the same qualities as bigatan, requiring the same habitat.

Bebe (unidentified), (plate 1; fig. d), is found in black sand in fresh water rivers. It varies a great deal in size ranging from a few centimeters to ten centimeters along the greatest diameter. The shells vary in color from dark green to black. They are collected by sifting the sand. They make an excellent soup (Seale, 1912). In Manila they sell for 7 centavos a kilogram.

Tihim (*Tellina incerta* Deshayes (?)) lives in the same environment as the bebe. In fact, they are collected at the same time bebe is. The tihim has a green shell and the inside part turns violet when cooked. In Tayabas a kilogram of tihim sells for 20 centavos.

The camotpusa (Circe gibba Lk.) is abundant on the sand bars and sandy beaches of Tayabas Bay. It is also found along the beaches of Manila Bay. The shell has ridges radiating from the posterior to the anterior portion. Black streaks across the hinge are on a white background (Seale, 1912). It makes a very delicious soup. It sells at 6 centavos a kilogram in Manila.

Punao (*Tapes striatus* Chemnitz) is one of the highest priced clams. Ordinarily, it is light brown with low ridges running parallel to the margin of the shell. It is collected by scratching the sand with a dull bolo when the beach is exposed, or by watching for a characteristic upward current visible at the surface of the shallow water, and at once digging below it; here the clam is located.

Collecting this particular clam has become a sort of sport among Manila college girls who spend vacations in Unisan, Tayabas and other coast towns. During low tides boys and girls collect punao. The personal experience of the writer is that it is not the catch that counts but the fun of gathering the clams.

This clam sells at 20 centavos a kilogram.

Fresh water shrimp (*Palaemon sundaicus* Heller (Herre)) lives under vegetable debris in fresh water. People around Laguna de Bay have acquired a certain dexterity in catching groups of them. They stick bundles of twigs into the mud under water with long bamboo poles. After a certain length of time, they raise these bundles and pass nets under them thus catching the shrimps that had taken up their abode on the artificial shelters. In appearance there is not very much difference between fresh and salt water shrimp. Close study, however, will reveal that the fresh water shrimp has a shorter cephalothorax and abdomen but larger and longer pinchers than the salt water. Both are highly regarded as food. Fresh water shrimps around Laguna de Bay sell at about 25 centavos a kilogram. The sample was obtained from Los Baños, Laguna.

Salt water shrimp (*Penaeus* sp. (Herre)) is found in brooks and at the mouth of rivers flowing into Tayabas Bay. A comparison of salt water with fresh water shrimps is given in the preceding paragraph. Salt water shrimps are caught with nets or with lights and portable traps on dark nights. In the Lucena, Tayabas, market, a specimen measuring 15 centimeters long will sell for 3 centavos. The material used in this study was caught in Unisan, Tayabas.

Alimasag (unidentified), (plate 1; fig. f), is found along the coast of Tayabas Bay in shallow water with sandy or rocky bottom. When fresh, the chitinous covering is green with curious brown markings all over the dorsal part of the cephalothorax and the appendages. The ventral side is white. All the chitinous covering turns red when cooked. Alimasag vary in size from four centimeters to 20 centimeters at the longest axis of the cephalothorax. When chased, they bury themselves in the sand, their backs just appearing on the surface. They can then be caught by grasping the posterior side with the hand. Held in this way they are harmless as they cannot reach the hand with their powerful pinchers. Portable traps with the aid of lights are used also on dark nights. These crustaceans command high prices because of their palatability. Those of good size will sell at 50 centavos for two or three in Calamba, Laguna, where it is imported and sold.

Alimañgo (unidentified), (plate 1; fig. h), is a species found in salt water living in holes among the rocks. This crustacean is caught in the same way as the alimasag. It is black when fresh but turns red when cooked. There are several varieties of this species in the rivers and marshes. They are a table delicacy. They sell ordinarily at 50 centavos for three in Unisan, Tayabas, where the specimen came from.

Pusit (unidentified), (plate 1; fig. a), is caught on moonlit nights in fish traps with the aid of fish nets. It is popularly believed by fishermen that this squid goes ashore during bright nights in quest of food. It is soft-bodied and provided with tentacles. Its means of protection is only a bag of ink. When an enemy is in sight it secretes a small amount of ink which

it shoots instantly posteriorly. This secretion is enough to blur the surrounding water so it can escape. This squid is a very good food. When fresh, 5 centavos will purchase a piece 20 centimeters long. They are sold fresh and dried.

The kind shown in plate 1 is good for making *pansit*. This dish is very popular in Chinese restaurants. The material examined in this investigation was obtained in Unisan, Tayabas.

EXPERIMENTS AND RESULTS

Sampling

Only the edible portion containing both flesh and liquid was analyzed for organic constituents. The sample was ground in a meat grinder. The liquid and shredded flesh were collected and stirred to obtain as far as possible a homogeneous mixture. Then representative portions were used for analysis. Six samples were used for each determination made.

Experimental procedure

The methods used by the Association of Agricultural Chemists (1919) and those compiled by the Illinois Agricultural Experiment Station (1920) were employed in this investigation.

Moisture. The loss in weight of about 5 grams of the materials dried to a constant weight at 100°C. divided by the weight of the sample multiplied by 100 gave the percentage of moisture.

Ash. The sample used in the determination of moisture was used in determining the percentage of ash. The dried material was charred and ignited to a low redness. The increase in weight of the crucible gave the amount of ash. The weight of ash divided by the weight of sample times 100 gave the percentage of ash.

Fats. A weighed fresh sample was placed in a fat-free thimble and dried to a constant weight at 100°C. It was then placed in a Soxhlet extractor for three successive days for about eighteen hours. A longer time was found to be unnecessary. The loss in weight of the dried material divided by the fresh weight of the fresh sample multiplied by 100 gave the percentage of fats.

Proteins. The ordinary Kjeldahl method of determining nitrogen was employed. The percentage of nitrogen multiplied by 6.25 was considered the percentage of proteins in the sample.

Carbohydrates. Carbohydrates were determined by difference. After subtracting from 100 per cent the sum of the percentages of moisture, ash, fats, and proteins, the undetermined remainder was attributed to carbohydrates.

Calorific value. The calorific value per hundred grams was obtained by multiplying the percentage of fat by 9.3 and the percentage of proteins and carbohydrates by 4.1 The sum of the three products was taken to represent the calorific value of the material.

Total nutrients. The sum of the percentages of fats, proteins, ash and carbohydrates was considered to represent the total nutrients.

Nutritive ratio. Nutritive ratio was obtained by dividing the percentage of carbohydrates plus the percentage of fats multiplied by 2.25 by the percentage of proteins.

DISCUSSION OF RESULTS

Table 1 shows that about 40 per cent by weight represents the edible portion of the mollusks and crustaceans studied in this experiment. This portion, in turn, contains 80 per cent moisture.

Taktakin (unidentified), salt water shrimp (*Penaeus* sp. (Herre)), pusit (unidentified), balakwit (*Strombus canarium* Linn.), and talitapong (*Murax capucipus* Lk.), all salt water species of shellfish, have a high calorific value. By comparing salt and fresh water shrimps, one will find that the former has a higher food value than the latter. Usually, salt water species of shellfish have a high percentage of proteins, fats, and ash, while fresh water species are higher in carbohydrates.

Of all the species examined, pusit gives the highest in edible portion. It has also a relatively high percentage of proteins. This shows that there is very little waste in the weight of the material bought so that it is reasonable to pay a higher price for it than for other kinds.

Table 1 shows that the analyses by Atwater and Brynt, Bacol, and by the writer agree fairly well. The difference in the protein content of lobster as determined by Atwater and Brynt (16.4 per cent) and by the writer (21.2 per cent) may be explained by the difference in the stage of development of a lobster.

In this table it is shown that 20 per cent of the edible portion on the wet basis of Philippine shellfish represents the total nutrients.

The nutritive ratio in balakwit (*Strombus canarium* Linn.), 1:4 is the highest. This is considered a narrow ratio. It means that out of the total digestible protein in Philippine shellfish there is at most 25 per cent carbohydrates and fats combined.

SUMMARY OF CONCLUSIONS

(Philippine shellfish analyzed)

1. Philippine shellfish contain about 40 per cent edible portion and the remaining 60 per cent represents shell or chitinous skeleton.

2. The protein content ranges from 4 to 20 per cent.

High in proteins (over 10 per cent of the edible portion on the wet basis) are: Alimasag (unidentified); Barong (*Pinna virgata* Menke); bigatan (*Arca granosa* Linn.); *halang* (*Fasciolaria trapezium* Linn.); litog (*Arca granosa* Linn.); manlit (*Tridacna cumingii* Reeve.); patanang (*Murex ramosus* Linn.); pusit (unidentified); salt water shrimp (*Penacus* sp. (Herre); susong tabang (unidentified); taktakin (unidentified).

3. The percentage of fats ranges from 0.5 to 3.5 per cent. High in fats (over 20 per cent) are: alimañgo (unidentified); alimasag (unidentified); bebe (unidentified); bigatan (*Arca granosa* Linn.); biñga (*Melo aethiopica* Linn. Var. Broderipii Gray); punao (*Tapes striatus* Chemnitz); salt water shrimp (*Penaeus* sp. (Herre)); taktakin (unidentified); talaba (*Ostrea orientalis* Chemnitz); tibangca (*Nerita);* tihim (*Tellina incerta* Deshayes (?)).

4. The ash varies from 0.5 to 4.5 per cent. In some, ash sand is found in the ignited material. Probably, it was held as grit in the alimentary tract of the shellfish. High in ash (over 4 per cent) are: balakwit (*Strombus canarium* Linn.); bitubituin (unidentified); caligay (unidentified); cohol (*Ampullaria vittata* Reeve); susong dagat (*Cerithium vertagus* Linn.); susong tabang (unidentified); talaba (*Ostrea orientalis* Chemnitz).

5. The undetermined portion attributed to carbohydrates is around 6 per cent. Usually, shellfish are a wholesome food either raw (for some species) or cooked.

High in carbohydrates (over 10 per cent) are: balakwit (*Strombus canarium* Linn.); bebe (unidentified); bitubituin (unidentified); caligay (unidentified); *fresh water shrimp* (*Palaemon sundaicus* Heller (Herre)); pusit (unidentified); talitapong (*Ranella vittata* Reeve).

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TABLE 1

Comparative composition of Philippine shellfish

NAME OF SAMPLE[a]	REFUSE	EDIBLE PORTION	MEAT INCLUDING LIQUID					TOTAL NUTRIENTS	CALORIFIC VALUE PER 100 GRAMS	NUTRITIVE RATIO 1 TO
	Shell	Meat and liquid	Moisture	Fats	Proteins	Ash	Undetermined (Carbohydrates)			
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Alimañgo, (unidentified)	42.12	57.88	84.49	2.55	7.40	1.89	3.67	15.51	70	1.27
Alimasag, (unidentified)	42.98	57.02	81.29	2.38	13.12	2.80	0.41	18.71	75	0.44
Balakwit, *Strombus canarium* Linn.	89.02	10.98	72.46	1.55	4.78	5.16	16.05	27.54	100	4.09
Barong, *Pinna virgata* Menke	60.58	39.42	80.89	0.77	11.32	3.92	3.10	19.11	65	0.43
Bebe, (unidentified)	55.30	44.70	78.14	2.29	7.58	0.55	11.44	21.86	100	2.19
Bigatan, *Arca granosa* Linn.	78.02	31.98	79.61	3.24	13.00	1.37	2.79	20.39	95	0.78
Biñga, *Melo aethiopica* Linn. Var. *Broderipii* Gray	28.97	71.03	80.15	2.42	8.75	1.67	7.01	19.85	85	1.43
Bitubituin, (unidentified)	61.36	38.64	73.20	0.38	9.21	4.55	12.66	26.80	95	1.47
Caligay, (unidentified)	60.01	39.99	77.86	0.62	4.21	4.23	13.08	22.14	75	3.44
Camutpusa, *Circe gibba* Lk.	81.92	18.08	85.79	0.85	5.43	2.43	5.50	14.21	50	1.36
Capios, (unidentified)	87.28	12.72	87.60	0.35	7.67	2.67	1.71	12.40	40	0.33
Cohol, *Ampullaria vittata* Reeve	39.69	60.31	80.43	1.87	8.00	4.10	5.61	19.57	70	1.23
Fresh water shrimp, *Palaemon sundaicus* Heller (Herre)	39.65	60.35	77.91	0.33	8.26	2.31	11.09	22.09	85	1.46
Halang, *Fasciolaria trapezium* Linn.	66.30	33.70	76.14	1.43	13.48	2.08	6.87	23.86	95	0.75
Litog, *Arca granosa* Linn.	77.05	32.95	80.51	0.58	10.66	1.37	7.86	19.49	80	0.86
Manlit, *Tridacna cumingii* Reeve	88.72	11.28	80.06	0.52	11.91	2.77	2.81	19.94	65	0.33
Patanang, *Murex ramosus* Linn.	77.54	22.46	79.58	0.77	17.07	1.87	0.71	20.42	80	0.14
Punao, *Tapes striatus* Chemnitz	64.29	35.71	84.23	2.34	6.16	1.70	5.57	15.77	70	1.76
Pusit, (unidentified)	2.44	97.56	74.19	0.53	11.84	2.37	11.07	25.81	100	1.04
Salt water shrimp, *Penaeus* sp. (Herre)	37.42	62.58	72.03	3.53	21.18	2.55	0.71	27.97	120	0.41
Susóng dagat, *Cerithium vertagus* Linn.	79.64	20.36	80.42	0.61	8.47	6.80	3.70	19.58	55	0 60
Susóng tabang, (unidentified)	70.95	29.05	79.23	0.83	10.81	4.62	4.51	20.77	70	0.59
Taktakin, (unidentified)	66.01	33.99	79.33	2.14	15.48	2.64	0.41	20.67	165	0.34
Talaba, *Ostrea orientalis* Chemnitz	82.10	17.90	83.11	2.62	7.05	4.64	2.58	16.89	65	1.20
Talitapong, *Murex capucinus* Lk.	67.73	32.27	73.54	0.56	8.53	2.50	14.87	26.46	100	1.88
Tapalang, *Cyrena gigantea* Prime	35.01	64.99	85.04	0.42	8.63	1.96	3.97	14.96	55	0.57
Tibangca, *Nerita*	62.51	37.49	84.40	2.12	6.42	1.80	5.26	15.60	65	1.56
Tihim, *Tellina incerta* Deshayes (?)	77.78	22.22	86.42	2.18	4.24	1.49	5.67	13.58	60	2.50
Average	61.80	39.91	79.89	1.46	9.67	2.82	6.09	20.07	80	1.27

[a] All local names are given in Tagalog dialect.

PLATE I

Fig. *a.*–pusit; *b.*–susong tabang; *c.*–taktakin; *d.*–bebe; *e.*–bitubituin; *f.*–alimasag; *g.*–caligay; *h.*–alimañgo; and *i.*–capios.

THE CULTURE AND COST OF PRODUCTION OF BARIT IN BAY, LAGUNA[1]

RAMÓN C. ORDOVEZA

WITH FOUR TEXT FIGURES

Barit, or zacate (*Leersia hexandra* Sw.) is extensively cultivated in the Philippines, particularly around the city of Manila and in the neighboring provinces. It is used as a soiling for horses to take the place of the dry feeds, as hay and silage do in temperate countries. The daily ration of Philippine horses consists principally of barit soiling.

The provinces of Rizal, Laguna, Cavite, and Bulacan supply the daily demand for this soiling in Manila. In the province of Laguna, the town of Bay is one of the oldest and largest producers of this crop. This fact, together with the growing importance of the barit industry, induced the writer to carry out this investigation.

Although barit is so important as a feed for horses in the Islands, there has been, heretofore, no work on its culture published. It is, however, mentioned by Galang and Paulino (1925) and by Piper (1924)[2] as a forage grass extensively cultivated in the Philippines.

It was the purpose of this work to study the culture of barit in the town of Bay. The study included experiments on fertilization and on weeding. This report also presents data on the cost of production to show the average income of a barit farmer.

This study was carried out in some of the plantations in Bay from October 1926 to December 1927. In addition, data on production from 1922 up to 1925 are included. The experiments here reported were carried out in the Ordoveza barit plantation.

CULTURE

It was the growing demand for barit in Manila which began about 1920 that aroused the interest of farmers in this forage plant in some nearby localities with good transportation facilities to the capital. The farmers in Bay were not getting much profit out of their rice lands, so most of them

[1] Thesis presented for graduation, 1928, with the degree of Bachelor of Agriculture from the College of Agriculture No. 265; Experiment Station contribution No. 539. Prepared in the Department of Agronomy under the direction of Dr. Toribio Vibar.

[2] Galang, F. G., and P. L. Paulino. 1925. A progress report on forage crop investigations at the Lamao Experiment Station, Lamao, Bataan. The Philippine Agricultural Review **8**: 3-31.

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transformed their rice fields into barit plantations. The area devoted to this forage plant in Bay has increased considerably since 1921.

Site for a barit plantation

One of the important points to be considered in selecting a site for a barit plantation is the facility for transportation from the field to the market. This point is important because barit will not remain fresh for more than two days, and if wilted it is useless for feeding purposes. In Bay, most of the barit fields are located near the railroad station.

Generally, soils adapted to the culture of lowland rice are suitable for the growing of barit. In Bay, such soils are of the clay loam type; they are watered by a good irrigation system.

Preparation of the field

The preparation of the land is similar to that for lowland rice. The field is divided into paddies with well constructed dikes. It is kept under water and plowed with the native plow. Two plowings are necessary, each followed by thorough harrowing with the native harrow called *suyod*. After

Fig. 1.—A paddy plowed under wet conditions.

the first harrowing, the field is kept under water until the weeds have decayed; then, it is harrowed again. By the second harrowing the field is made smooth and even, and is then ready for planting.

The field is generally prepared during the rainy season when there is plenty of water, and also barit cuttings for planting purposes.

Planting

Before planting, the paddies are flooded to about two to five centimeters deep. The materials for planting are the shoots or the same portions of the plant that are fed to horses. The old shoots that are too tough to be

used as feed may also be used, but they do not give as high a percentage of growth as the medium ones. The shoots, or cuttings, are laid uniformly on the water and then pressed down so that they settle in the mud. (See fig. 2.) The thickness of planting depends upon the amount of seedlings available. Some farmers claim that the thicker the planting, the better

Fig. 2.—A newly planted paddy.

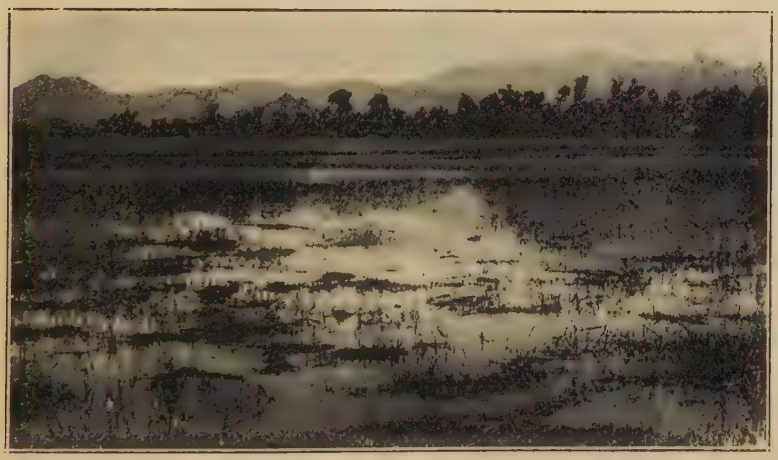

Fig. 3.—A paddy one week after planting. Note sprouts shooting up.

the result, because there will be less chance for the weeds to grow. About 200 bales to the hectare is the usual rate of planting. After planting, the field is kept flooded until the sprouts begin to come out. When this stage is reached the field is drained but kept moist. When the shoots attain a height of about seven centimeters (three inches), the field is again flooded to a depth of about three centimeters; this depth is maintained until the plants reach maturity.

Cutting or harvesting

The first cutting is done about one or two months after planting; the time depends upon the climatic conditions. The barit is cut when it is about thirty-five centimeters in height. Lodging is an indication of over-maturity. The barit from Bay is usually shipped to Manila on a noon train, hence, cutting is generally done late in the afternoon and early the following morning so the grass will be fresh. A form of native sickle is used for cutting. A big handful is cut and then tied in a bundle with a few blades of barit. One hundred of these bundles are tied together and constitute one bale. The size of the bale is not uniform throughout the year. When the price of barit is high it is smaller than when the price is low. This variation is because the bale is the unit of measure in the market.

All the barit produced by a farmer is usually under contract by one or more buyers in Manila. Generally, there is a fixed number of bales sent to the buyer every day. Since barit is shipped to Manila by rail, each farm has its own mark on each bale so that the buyer can identify the product from different farms. Some farmers use banana leaves inserted in each end of the bale for the mark, while others use papaya leaves.

From the Ordoveza farm, data on production of barit of a ten-paddy lot from 1922 to 1925, inclusive, were secured and are presented in table 1. The field was planted on December 1, 1921, and the first cutting was made on February 1, 1922. It will be seen in table 1 that from 1923 to 1925 there were paddies without production during certain months of cropping. This was because of the great variability in the growth and maturity of the plants in the different paddies. The unevenness in growth and in maturity of the plants was more pronounced as the fields or plantations became older. The total production of the ten paddies under study during 1922, 1923, 1924,

TABLE 1

Showing longevity of a barit field

1922 production

DATE CUT	AREA IN SQUARE METERS										TOTAL
	689	693	633	679	625	637	641	642	670	679	6628
	bales	*bales*	*bales*	*bales*	*bales*	*bales*	*bales*	*bales*	*bales*	*bales*	
February..	46	40	40	44	45	37	42	44	52	45	435
April.....	37	20	22	32	33	27	25	35	25	36	292
June.....	56	50	50	50	40	44	30	40	38	40	438
July.....	34	18	18	24	24	18	17	18	36	22	229
August....	25	24	17	27	22	24	8	26	25	22	220
October...	14	28	25	16	14	30	25	22	30	14	218
November.	22	15	16	27	21	20	22	27	24	26	220
December.	—	—	14	12	23	19	18	24	20	25	155
											2207

1923 production											
January...	14	14	—	8	4	—	—	—	—	—	40
March....	21	21	30	23	27	27	22	24	22	27	244
April.....	—	—	—	18	—	—	—	25	—	21	64
May.....	24	5	15	6	19	20	19	—	20	—	128
July.....	19	3	12	22	16	16	20	18	20	22	168
August....	10	17	11	15	15	14	15	16	16	20	149
September.	22	8	27	24	21	17	18	18	20	18	193
October...	—	14	14	—	23	20	25	26	24	28	174
November.	20	—	—	24	—	—	—	—	—	—	44
December.	26	22	25	24	21	28	28	36	27	28	265
											1469
1924 production											
January...	14	—	16	26	17	23	20	26	22	10	174
February..	21	21	23	—	—	—	—	—	—	—	65
March....	—	—	—	21	—	22	33	25	21	22	144
April.....	—	—	—	—	—	—	21	—	—	2	23
May.....	32	21	31	24	22	—	—	—	—	16	146
June.....	15	—	—	—	30	—	55	—	60	8	168
July.....	22	16	—	52	38	20	32	7	33	42	262
August....	20	10	16	12	10	—	16	20	—	—	104
September.	—	—	—	—	—	20	14	24	6	—	64
October...	22	22	23	20	12	36	8	30	20	18	211
November.	14	—	—	10	10	10	10	10	10	12	86
December.	—	10	18	—	22	—	—	14	18	—	82
											1529
1925 production											
January...	6	12	6	14	8	10	12	12	12	12	92
February..	20	14	14	6	—	10	8	8	6	16	112
March....	—	—	—	—	—	—	—	—	8	—	8
April.....	—	—	—	—	6	—	—	—	—	—	6
May.....	—	—	—	4	—	—	—	—	—	—	4
June.....	24	34	28	—	34	34	—	—	—	—	154
July.....	14	20	12	16	26	20	24	22	20	22	196
August....	—	—	20	10	—	18	10	—	10	—	68
December.	14	10	12	12	10	14	8	12	4	8	104
											744

and 1925 were 2207, 1469. 1529. and 744 bales, respectively. The field was no longer productive after the fourth year. The average life of a barit field in Bay is four years while around Manila where farming is more intensive, the barit plantations are renewed every one or two years.

The number of cuttings made in a year on this ten-paddy field was about seven, and the intervals between these cuttings varied with the season. Cuttings were more frequent during the rainy than during the dry months. It may be noted in table 1 that in some cases some paddies produced no grass for as long as four months. The reason was that the grass harvested was sometimes too weedy to be sent to Manila. So the practice of the *zacatero*, the man who cuts and bales the grass, was to cut

the grass but not to bale it. This grass was either piled on the dikes or thrown away. In such cases no record was made.

Weeding

Among the problems of the barit farmer the weed question is the most important. There are many weeds in the barit field. The gume (*Fimbristylis miliaceae* (Linn.) Vahl.), and kumot palaka (*Panicum* sp.) are common among the weeds which crowd out the plants and finally kill them. If a newly planted field is left unweeded, it may not last for more than a year, but if properly taken care of it may last for even five years. A newly planted field has very few weeds, they become numerous as it becomes old.

If cheap labor is available, hand weeding is the best method of eradicating these weeds. This is the procedure in the fields around Manila where women are employed to pull up the weeds.

Fig. 4.—The *latak* in operation. Note the condition of the barit.

In Bay a *caminero*, the man who attends to the weeding and care of the plantation, has a larger area, comparatively, to take care of, hence, he can not clean the plantation by hand weeding alone. So he resorts to other methods, one of which is the use of the *latak* (see fig.4). This implement is similar in construction to a roller, except that its surface is serrated. It is pulled by a carabao and is run over a weedy paddy until the grass lies flat on the ground. When the paddy is subjected to this treatment the weeds generally do not have the power to grow again, but the barit can still produce shoots.

Table 2 presents the result of an experiment on the effect of this implement on the production of barit. The paddies in which this implement was rolled were old and weedy. The *latak* was run over them one month after the December cutting in 1926. It will be seen in table 2 that the average

production of the ten paddies in December 1926, just before they were treated with the *latak*, was 377 bales to the hectare, while in February, April, and June, after they had been treated with the *latak* the corresponding average yields were 569, 387, and 286 bales to the hectare. This shows that there

TABLE 2

Effect of the latak on the yield of barit
(1926–1927)

LOT NO.	NOVEMBER (NO LATAK)	DECEMBER (NO LATAK)	FEBRUARY	APRIL	JUNE
	bales per hectare	*bales per hectare*	*bales per hectare*	*bales per hectare*	*bales per hectare*
1	460	400	630	230	310
2	490	460	580	270	260
3	500	470	570	570	310
4	480	410	640	390	320
5	510	390	580	360	280
6	330	270	410	330	220
7	540	480	660	510	380
8	480	310	610	380	210
9	430	310	520	480	360
10	390	270	490	350	210
Average	461	377	569	387	286
Check	450	340	210	90	——

NOTE:—*Latak* was used one month after December cutting. Hence, the November and December cuttings were before the *latak* was used.

was a sudden increase in the cutting after the *latak* was used, then, a gradual decrease followed. The plot which was not treated by the *latak* showed a steady decrease in yield; the yields to the hectare for December, February, and April being 340, 210, and 90 bales, respectively. The control had another disadvantage in that the weeds in the barit made cutting more difficult, hence, more expensive, because the *zacatero* had to remove the weeds from each bunch. Buyers reject weedy barit. It may be seen from this experiment that the use of the *latak* in weedy barit fields is advantageous, for it not only increased the yield, but also lengthened the life of the plantation.

Proper irrigation may control the weeds to a certain extent. It is a common experience that weeds, especially the *gume*, are more prevalent during the dry season. The control of the water level in the culture of barit is so important that it deserves special attention. The general practice in Bay is to keep the field just moist after cutting. Then as soon as the stubs have produced sprouts, the water level is increased gradually to a depth of about three centimeters. If the field is irrigated immediately after cutting most of the shoots will decay. On the other hand, if it is not irrigated at all, some kinds of weeds which flourish in dry soil will become so prevalent as to cause considerable injury to the crop. Hence, the best practice is, moist field after cutting; after sprouting, gradually increase water to three centimeters in depth.

Fertilization

As stated in first part of this paper, the cultivation of barit in Bay was begun about seven years ago. In this period most of the barit plantations have been replanted but once. In table 2 it may be seen that as the field grew older the yield decreased. This decrease in yield may have been the effect of noxious weeds which killed some of the plants, or may have been caused by soil exhaustion, or it may have been the result of both.

An experiment on the effect of fertilizers on old barit plantations was conducted on the Ordoveza farm. The paddies used in this experiment were about three years old and were already giving poor yields. The fertilizers were applied one week after the September cutting in 1926. Washing off of the fertilizers from one paddy to another was prevented by having good control of the irrigation water.

Hoz with a formula of 13-6-2 was used as the standard fertilizer. This was applied at the rate of 200 kilograms to the hectare. The other fertilizers, ensac, ammo-phos, complete, guano, and copra meal were applied in amounts so that the total nitrogen of each was the same as that supplied by 200 kilograms of hoz (standard). Lime was applied at the rate of 200 kilograms to the hectare.

The experiment was carried in triplicate plots, the main object of which was to minimize as much as possible the error due to soil variability. The size of the bales produced from the different paddies fertilized was made as uniform as possible so that comparison of the yields would be more accurate.

Table 3 gives the average production of the fertilizer experiments, computed in terms of bales to the hectare. As may be seen in this table, ammo-phos, hoz, and complete fertilizers gave significant increases in yield in the November cutting, about one month after the application of the fertilizers. Guano gave a slight increase, while copra meal, ensac, and lime decreased yield as was the case of the control. The high production

TABLE 3

Effect of commercial fertilizers on the yield of barit
(1926–1927)

FERTILIZERS	SEPTEMBER (NOT FERTILIZED)	NOVEMBER	DECEMBER	FEBRUARY	APRIL	JUNE
	bales per hectare	*bales per hectare*	*bales per hectare*	*bales per hectare*	*bales per hectare*	*bales per hectare*
Ammo-phos	430	1280	850	410	250	211
Hoz	230	430	430	200	181	40
Complete	230	360	270	190	50	20
Guano	410	420	330	220	190	—
Copra meal	450	410	370	390	200	—
Ensac	320	320	200	170	—	—
Lime	640	586	404	320	—	—
Check	450	400	340	260	—	—

NOTE:—All the lots were fertilized after September cutting except the check. Hence, the September cutting was before fertilization.

of the paddies treated with ammo-phos, hoz, and complete fertilizers was not, however, maintained beyond the second cropping after the application of the fertilizers. In the subsequent cuttings, the yields gradually declined. The fertilizers that gave the highest increase in yield have a good combination of nitrogen and phosphorus (see table 4). Barit did not react favorably with ensac which is supposed to contain as much as 17 per cent nitrogen. This unfavorable result is probably due to the fact that it has no phosphorus. Lime had no effect on the growth and production of barit.

TABLE 4

Analysis and source of fertilizers used

FERTILIZER	ANALYSIS			SOURCE
	N	P	K	
	per cent	*per cent*	*per cent*	
Ensac	17	0	0	Botica Boie
Ammo-phos	17	20	0	Botica Boie
Hoz	13	6	2	Menzi & Company
Complete	10	6	2	Menzi & Company
Guano	12	4	2	College of Agriculture
Copra meal	8	3	2	Philippine Refining Corporation
Lime	—	—	—	College of Agriculture

COST OF PRODUCTION OF BARIT

In considering barit as a crop, the income of a farmer engaged in its production is important. Data along this line were gathered from farmers actually engaged in the industry. It might be stated that about five or six years ago when barit was not yet extensively cultivated in Bay the income from a hectare of land was comparatively high in spite of the high cost of production. This was because of the great demand for barit and the limited supply of the crop. The price per bale of barit in that period rose as high as ₱0.50, about twice what it is at present. It was this high price that induced farmers to grow barit until the competition has become so keen that the price of the forage has fallen considerably.

The figures given below are averages of the cost of production on four barit farms in Bay, Laguna. These records are for the year 1927. The expenses in starting a hectare of barit plantation are:

Preparation of the land	₱80.00
Cost of seedlings (200 bales at ₱0.24)	48.00
Cost of planting	20.00
Total initial cost	₱148.00

The expenses in cutting one bale of barit are:

For *zacatero*	₱0.10
For *cargador*[3]	0.03
For *caminero*	0.03
Total	₱0.16

[3] The *cargador* is the laborer who carries the grass from the plantation to the railroad station.

The price of one bale of barit in Bay at the time of writing (January 1928) is ₱0.24. After subtracting ₱0.16 (expenses for cutting) from ₱0.24, it leaves a balance of ₱0.08. The farmer must receive some compensation for management or allow wages to hire a farm manager to do the work for him. One-fifth of the ₱0.08 (gross income per bale) or ₱0.016 per bale is generally paid for this labor. For miscellaneous expenses an additional expense of ₱0.004 per bale is incurred. If ₱0.016 is added to this miscellaneous expense or ₱0.004, it gives a total of ₱0.02. Deducting this total from ₱0.08, only ₱0.06 is left as gross gain on every bale of barit.

In Bay, about 6,000 bales of barit are produced from one hectare during the duration of the life of the plant which is about four years. Multiplying 6,000 by ₱0.06 it gives ₱360.00 as gross income from one hectare for four years. Subtracting from this the initial expense of ₱148.00, there is left ₱212.00 as net income for four years or ₱53.00 for a year. The tax of a hectare of land in Bay is ₱2.61. This tax reduces further the net income to ₱50.29 per hectare a year. Subtracting the interest (10 per cent) on the invested capital (₱148) for one year which is ₱14.80, we have ₱35.59 as net gain per hectare per year. The average assessed value of one hectare of barit land in Bay is ₱300. With the application of a given amount of labor and capital, for the production of barit, one hectare of land will yield a net income of ₱35.59 a year, or 11.85 per cent of its assessed value.

Summarizing the average expense and income from a hectare of barit in Bay, Laguna, we have the following:

Expenses:	
Initial cost in planting one hectare of barit	₱148.00
Expense for cutting 6,000 bales at ₱0.16 per bale	960.00
Wages of the farm manager @ ₱0.016 per bale	96.00
Miscellaneous expenses @ ₱0.004 per bale	24.00
Land tax for four years @ ₱2.61 per year	10.44
Interest on capital invested for four years	59.20
Total expenses	₱1297.64
Gross income for four years (6,000 bales @ ₱0.24 per bale)	₱1440.00
Net income for four years on one hectare	142.36
Net income per year per hectare	35.59

SUMMARY OF CONCLUSIONS

From the results of experiments actually conducted, the following conclusions may be drawn:

1. Old barit fields to which were applied the different kinds of commercial fertilizers responded differently to the treatment. Ammo-phos, hoz, and complete fertilizers gave the best results. However, the high production after the application of these fertilizers was not maintained in the succeeding cuttings; in the fourth cutting, six months after the application of the fertilizers, the yields were very low.

2. A native implement, *latak*, is effective in killing weeds. Tests on the effectiveness of this implement showed that it was able to lengthen the life of old barit fields, (see table 2).

As a result of the writer's investigation of the barit culture in Bay, Laguna, the following data were secured:

1. The barit industry in Bay, Laguna, is about seven years old. The fields devoted to barit growing are lowland and are in the vicinity of the railroad station.

2. The field for barit is prepared at the beginning of the rainy season and the method is very similar to that for lowland rice.

3. Planting is done by spreading barit cuttings over the field at the rate of about 200 bales a hectare. Barit is grown under irrigation water.

4. Barit fields in Bay are cropped seven times a year; the intervals between cuttings depend on the season. The life of an average barit field in Bay is about four years.

5. Weeds are the worst menace of barit. The *latak* is the common implement used to control the noxious weeds.

6. The average annual net income from one hectare of barit in Bay, Laguna, is about ₱35.00.

THE COMPOSITION OF COMMERCIAL SUGAR FROM PHILIPPINE CENTRALS[1]

DELFIN J. SUERTE

The author studied the composition of centrifugal sugar from three sugar producing regions: Luzon, Negros, and Mindoro. His purpose was to secure valuable data which may be used as a working guide for the improvement of Philippine sugar for export. The results obtained are from the combined production of 265,726.658 metric tons from nine centrals or 56 per cent of the total production of the Philippine Islands.

The methods of analysis given by Deerr[2] and those in the Official Methods of Analysis[3] were followed.

The results of the investigation disclosed the following facts:

(*a*) That Philippine sugars have relatively high percentages of gums.

(*b*) That the percentage of suspended solids and ash are comparatively low. In percentage of ash, Philippine sugars compare favorably with other cane sugars of the world.

(*c*) That the moisture content is comparatively high. The Philippine sugar is open to improvement on this point.

The following tabulations give the average proximate composition and ash content of raw sugar for the crop 1926–27 of sugars obtained from nine centrals:

Polarization	96.66°	
Gums	0.68	per cent
Suspended solids	0.10	"
Moisture	0.87	"
Ash	0.30	"
Undetermined	1.39	"
Total	100 00	per cent

Aluminum and iron oxides	0.86±0.01	per cent
Phosphoric acid	4.58±0.04	"
Calcium oxide	8.58±0.04	"
Magnesium oxide	3.10±0.05	"
Potash	48.86±0.06	"
Undetermined (carbon dioxide, sulfur trioxide, chlorine, soda, silica, etc.)	34.02±0.20	"
Total	100.00	per cent

[1] The data here given were taken from a thesis presented in 1927 by Delfin Suerte for graduation from the College of Agriculture with the degree of Bachelor of Science in Agriculture with Certificate in Sugar Technology. The thesis was prepared in Department of Agricultural Chemistry under the direction of Dr. Manuel L. Roxas.

This paper was prepared by Dr. F. T. Adriano of the same department. Thesis No. 266; Experiment Station No. 540.

[2] Deerr, Noel. 1921. Cane sugar. 2nd ed., viii + 535 p., London: Norman Rodger.

[3] Anonymous. 1925. Official and tentative methods of analysis of the Association of Official Agricultural Chemists. 2nd ed., xvi + 535 p., Washington: Association of Official Agricultural Chemists.

TABLE 1

Showing the composition of raw sugar from different centrals

CENTRALS	TONS[a]	POL.	GUMS	SUS. SOLIDS	ASH	MOISTURE	EXCESS MOISTURE	UNDETER-MINED	TOTAL
			per cent	*per cent*	*per cent*	*per cent*		*per cent*	
Bacolod	35,429.369	96.65	0.73	0.10	0.26	0.91	8.66	1.35	100
Binalbagan	34,971.728	96.80	0.61	0.09	0.27	0.86	7.50	1.37	100
Isabela	25,192.676	96.65	0.75	0.10	0.30	0.84	0.30	1.36	100
Ma-ao	33,494.559	96.50	0.71	0.11	0.30	0.99	13.14	1.39	100
Talisay	35,470.709	96.65	0.66	0.09	0.32	0.90	7.46	1.38	100
San Fernando	30,393.386	96.70	0.65	0.10	0.29	0.87	5.45	1.39	100
Del Carmen	40,686.271	96.60	0.68	0.13	0.29	0.81	–4.71	1.49	100
Calamba	24,767.290	96.80	0.62	0.11	0.36	0.69	–13.75	1.42	100
San José	5,320.670	96.55	0.71	0.12	0.28	0.93	7.83	1.41	100
Totals and averages.	265,726.658	96.66	0.68	0.10	0.30	0.87	4.19	1.39	100

[a] Metric tons.

TABLE 2

Showing the composition of the ash of sugar from different centrals expressed per 100 ash

CENTRALS	TONS[a]	Al_2O_3, Fe_2O_3	P_2O_5	CaO	MgO	K_2O	UNDETERMINED	TOTAL
Bacolod	35,429.369	0.95±0.01	3.90±0.03	8.58±0.03	2.78±0.06	46.74±0.06	37.05±0.19	100
Binalbagan	34,971.728	0.61±0.03	4.79±0.04	8.93±0.04	2.46±0.05	47.66±0.07	35.55±0.22	100
Isabela	25,192.676	0.80±0.02	3.69±0.05	9.67±0.05	2.69±0.06	51.45±0.07	31.70±0.25	100
Ma-ao	33,494.559	0.80±0.01	4.24±0.04	8.56±0.04	3.79±0.04	49.71±0.07	32.90±0.20	100
Talisay	35,470.709	1.14±0.02	4.72±0.04	10.18±0.05	4.24±0.04	48.46±0.06	31.26±0.21	100
San Fernando	30,393.386	0.97±0.01	5.21±0.04	6.74±0.05	2.88±0.03	48.25±0.05	30.95±0.18	100
Del Carmen	40,686.271	0.79±0.01	4.69±0.05	7.67±0.05	3.12±0.05	50.53±0.08	33.20±0.24	100
Calamba	24,767.290	0.82±0.01	5.14±0.05	8.30±0.05	2.52±0.05	48.52±0.06	34.70±0.22	100
San José	5,320.670	0.78±0.01	5.96±0.05	9.32±0.04	3.30±0.04	48.38±0.06	32.17±0.20	100
Totals and averages	265,726.658	0.86±0.01	4.58±0.04	8.58±0.04	3.10±0.05	48.86±0.06	34.02±0.20	100

[a]Metric tons.

TABLE 3

Showing the composition of the ash of sugar from different centrals expressed per 100 sugar

CENTRALS	TONS[a]	Al_2O_3, Fe_2O_3	P_2O_5	CaO	MgO	K_2O	UNDETERMINED	TOTAL
Bacolod	35,429.369	0.002	0.010	0.022	0.007	0.122	0.097	0.26
Binalbagan	34,971.728	0.002	0.013	0.024	0.007	0.129	0.095	0.27
Isabela	25,192.676	0.002	0.011	0.029	0.008	0.154	0.096	0.30
Ma-ao	33,494.559	0.002	0.013	0.026	0.011	0.149	0.099	0.30
Talisay	35,470.709	0.004	0.015	0.033	0.014	0.155	0.099	0.32
San Fernando	30,393.386	0.003	0.015	0.020	0.008	0.140	0.104	0.29
Del Carmen	40,686.271	0.002	0.014	0.022	0.009	0.107	0.096	0.29
Calamba	24,767.290	0.003	0.019	0.030	0.009	0.175	0.124	0.36
San José	5,320.670	0.002	0.017	0.026	0.009	0.135	0.091	0.28
Totals and averages	265,726.658	0.002	0.014	0.026	0.009	0.145	0.104	0.30

[a]Metric tons.

NOTE: PRODUCTION OF PYRETHRUM FLOWERS IN JAPAN

Pyrethrum is a necessary ingredient of certain insecticides indispensable in the unceasing warfare against insects. Estimates of the extent of insect depredations in the United States alone exceed the enormous amount of one and one-half billion dollars annually. It is not surprising, therefore, that pyrethrum flowers, obtained principally from Japan, comprise a large proportion of the United States crude-drug and botanical imports.

In Japan approximately one-half of the total production of insect flowers, one of the most important natural products exported, is grown in Hokkaido, and the remainder is about equally divided among the four prefectures of Hiroshima, Okayama, Yehime, and Wakayama. At present the cultivation of pyrethrum is practically confined to the Dalmatian variety. Only small quantities of Persian pyrethrum are raised, for experimental purposes. Figures for the production of pyrethrum flowers in Japan during the 1927 season are not yet available but for the preceding year were 1,641,514 kwan, or 6,839 short tons.

Quality determined by oil content—Three types of plant

The quality of pyrethrum flowers is determined by the percentage of oil which they contain. A guild of pyrethrum flower growers and exporters in Kobe will certify the quality of any lot of flowers and various Government laboratories also make tests. The guild is not recognized by the Government as are many similar organizations.

Three types of the Dalmatian pyrethrum plant are grown in Japan. The first variety has a small dark-pink flower, blooms profusely, and shows a good harvest; the second has a light-pink flower but blooms in less profusion than the first; and the third has a greenish-white flower of considerably larger size than either of the other two types, but a much smaller crop. The Persian type, with its larger flowers, can be gathered sooner than the Dalmatian, thus making it possible to plant pyrethrum after the rice has been harvested. It is also hardier and much less subject to corrosion. The Dalmatian, however, has a much larger number of blossoms and a higher oil content, and, accordingly, is preferred in Japan.

Highest yield in third and last year of plant's life

The pyrethrum crop is harvested in the autumn, usually before the plants are in full bloom, since the buds are said to contain more oil than the flowers. It is estimated that over a period of three years, the life of the plant, the yield per ton (one-fourth acre) averages 827 pounds per year. The yield for the three years is in the ratio 1:2:3, the highest occurring

in the third year. The crop harvested in Hokkaido is stated to be of the best quality and that in Hiroshima prefecture second.

Local consumption increasing yearly

The consumption of pyrethrum flowers, as well as stems, in Japan during 1927 has been conservatively estimated at 250,000 to 300,000 kwan (1,000 to 1,240 short tons). The local use of insecticides is growing rapidly and greater quantities of pyrethrum flowers are required each year. Domestic manufactures include an insect powder, made from pyrethrum flowers; an incense stick, made of the poorer grades of flowers, and sticks and stems combined with leaves of other plants; a powder incense of similar consistency; and a liquid pyrethrum used for spraying. . .

United States take over 90 per cent of flower exports

Previous to 1915 only small quantities of pyrethrum flowers were exported from Japan. . . .

The United States takes over 90 per cent of the total exports of pyrethrum flowers from Japan. Exports to the United States during 1925 amounted to 52,934 piculs, valued at 5,448,000 yen, and during 1926, 61,236 piculs, worth 3,217,000 yen. (Picul = 132.27 pounds.)

—*Commerce Reports* (U. S.).

EXTENSION DIVISION NOTES

Prepared by Moises M. Kalaw under the supervision of Prof. I. Elayda, Director, Extension Service

A Visiting Graduate

Mr. Gregorio Francisco, B. S., '17, and Master Farmer in 1923 was a June visitor at his Alma Mater. He was on his way home from prospecting in Tayabas for a coconut plantation to purchase. Since his graduation Mr. Francisco has been engaged in commercial rice farming in Sta. Rosa, Nueva Ecija. His success in his farm business was so pronounced that a Filipino capitalist employed him as manager of an *hacienda* of 4,000 hectares in Talavera, Nueva Ecija. As this *hacienda* was new land, it was Mr. Francisco's task to clear it and bring it under cultivation. This hardest job in land development is now in full swing. His compensation as manager is on the share basis with his employer, with the privilege of managing his own farm, also.

In his management Mr. Francisco's effort is in the direction of making the land produce as much as possible and handling the labor so as to satisfy both his employer and his laborers. He claims this part of farm management is half the final success.

Mr. Francisco has recently been prospecting in the island of Mindoro for a possible location for agricultural development. He claims to have found in the interior of that island extensive agricultural areas capable of irrigation and suited to the growing of coconut, abaca, and other staple crops. He emphasizes the great value of water on any agricultural land, as he has seen poor and unproductive land turned to highly profitable land when supplied with irrigation water.

Asked as to the possibility of agricultural graduates finding employment on private farms, Mr. Francisco replied emphatically that it depends altogether upon the attitude of the graduates. If they are modest as to expected compensation, they would surely find employment in some private *haciendas*. He said that he would employ four or five recent graduates in the *hacienda* under his management if they would accept a salary of say ₱50 or ₱60 a month, having for their object practical training. They would thus get in line for an opportunity to get a job of greater responsibility provided their work justified a favorable recommendation.

He stated that training in practical agricultural engineering, farm practice, farm management, agricultural marketing, rural sociology, and laws related to land and farm business is necessary for success in practical productive agriculture.

Selecting Land for Farm Crop Production

Land selection is an important factor in reasonable success in farming. Among several things that wise selection of agricultural land involves, the climate is the supreme factor; then come soil in its various aspects, topography, drainage, crops intended to be grown, neighborhood, labor supply, market and transportation facilities. There are other factors depending largely upon what the individual prospector intends to do.

In actual prospecting for agricultural land with an eye to selecting the best available information from and the opinion of old settlers in the locality counts a good deal. These can be readily secured in places already settled and developed. It would be difficult, however, to get such information in a new country where settlement is sparse. In this case one has to depend upon his own knowledge and judgment. Selecting land in unopened regions is more difficult and is more expensive because of travel and time consumed.

It was gathered from reliable sources in Davao that the Moros' way of selecting land for their primitive agricultural practice is to visit, a day or so after a torrential rain, a place thought to be desirable. If they find no standing water anywhere on the land, they consider this favorable. In other words they want to make sure by actual inspection that the land is naturally well drained.

Negritos in some mountainous regions in Luzon seem to be inclined to select land for their small plantings (*caiñgin*) that is provided with good

natural drainage. In cases actually seen their *caiñgins* are located on mountain slopes where running streams are near the land.

But people used to agricultural ways in comparatively well-developed agricultural regions, when they take up land in other places, especially in a new country, are very careful in the selection of their farms. They invariably take into account before making a decision such important factors as climate, soil, topography, drainage, market and transportation facilities, neighborhood, etc., as mentioned above.

Careful selection of land for agricultural purposes can never be too much emphasized. It is the main basis of the undertaking from both the business side and the life of the family whether it is a question of buying developed land or taking up a piece of public land through the privileges granted by the Philippine Land Law.

Ranching on the Slopes of Taal Volcano

It may be of interest to know that the slopes of the world famous Taal Volcano, the only island volcano known, is now serving a good purpose in agriculture. This is true in spite of several eruptions, the last in 1911 when some thirteen hundred lives were lost. Although some parts of the slopes of this volcano have always been good agricultural land, it was not formerly farmed as extensively as now. Besides the crops grown, large areas are used as ranges for cattle, carabaos, and horses. It may not be an ideal range, but it certainly has several natural advantages. There are no streams flowing through the land where the animals can get water, but the surrounding lake supplies this lack. There is enough grass for the animals. No fencing is needed. The animals get salt from the sand and stones which are abundant. In short the animals on this range hardly need human care.

There are, however, some hard ranch problems. Having very little contact with man the animals are wild, and it is very difficult to catch them. Hence, branding and castrating is rarely attempted.

How to catch the animals is indeed puzzling, especially to a new comer. The volcanic mountain is a very large area of rolling land with many dangerous precipices. One who is not acquainted with its topography cannot easily travel over it. There are many places inaccessible even to animals. Under this condition the trailing of animals is difficult. Only familiarity with the volcano makes it possible. At present the caretaker of the ranch catches his animals when he desires, by methods which though very crude are certainly practical under the conditions. Young ranchers may learn much from him in the way of solving ranch problems similar to his.

EXCHANGE NOTES

The Department of Conservation of the State of Louisiana is issuing a Bird Day Program to all the schools in Louisiana, a plea for the conservation of our bird life that should be taken to heart not only by the school

children of the state but by every citizen, and especially the agricultural part of the population as the benefit done to the farmer by the birds in keeping down insect pests is incalculable. The various pests that now prevail in the sugar cane fields should lead the sugar planters to concrete planning to preserve the bird life of our state.

—*The Planter and Sugar Manufacturer.*

Rayon is something more than an achievement in textiles. It is another positive proof to us that science has never heard of the phrase "it can't be done."

—*The American Review of Reviews* (New York).

The Balance Sheet for Insects

Combatting insect life and repairing the damage it does has become one of the major industries of this country. Only last year an eminent authority concluded that the damage to crops, animals, and property by insects has increased until it nullifies the expended labor of approximately 1,000,000 men. In monetary loss, this approaches two billion dollars.

Fernald estimates annual losses due to insects in the United States, as follows:

Field crops	$833,660,000
Animals and their products	431,450,000
Loss by human disease and death	350,000,000
Forests, forest products and materials in storage	300,000,000
Farm wood lots	100,000,000

To this must be added extra losses on fruit and truck crops, shade trees and ornamental shrubs and plants, and household goods and food. The damage done by clothes moths is close to $200,000,000 yearly, and fly screens cost this country about $50,000,000 per year.

Values Created by Insects

The approximate yearly production of the domesticated insects of the world is:

Raw silk	$400,000,000
Shellac	20,000,000
Honey	20,000,000
Beeswax	4,000,000

Some minor products include cochineal, from which carmine is made; cantharides, used in medicinals and cosmetics; tannin for writing ink (resulting from the stinging of oak trees by a wasp); and, at times, food for birds, fish, and hogs. Besides these direct contributions, insects perform the incalculable service of pollinating most of our finest vegetation, including fruit trees, several kinds of crops, and nearly all flowers.

—*Industrial Bulletin* of Arthur D. Little, Inc.

It is doubtful whether any kind of soil treatment pays a bigger interest on the investment than inoculation. Such a condition is not unexpected for not only are the benefits derived from inoculation large but the cost of such treatment is surprisingly small. In fact the latter may require only the expenditure of a few odd moments when the farmer is free from other necessary chores. It is not inferred, however, that inoculation can take the place of other soil treatment for the former is most effective upon soils in which the lime requirement has been satisfied and where the supply of available minerals is adequate for maximum yields. . . .

The object of inoculation is to supply the soil with bacteria suitable for nodule production on the legume which is to be grown on the land. . . .

Nodule bacteria may be secured from a large number of commercial laboratories at a cost ranging from 20 cents to $1 for a quantity sufficiently large to inoculate one bushel of seed. Reliable cultures are not only easy to handle but in addition there is no chance of transplanting weed seeds or injurious plant diseases.

—*Prairie Farmer* (Illinois).

COLLEGE AND ALUMNI NOTES

Dr. F. W. Foxworthy, formerly Dean of the Forest School, spent a few days on the Campus in June. Doctor Foxworthy for the past ten years has been Director of Forest Research in Federated Malay States, with headquarters at Kuala Lumpur. Doctor Foxworthy was returning from a leave of several months, five of which he spent in Africa. He traveled from Capetown to Cairo not by the most direct route, but by devious ways covering much territory.

Miss Anna F. Cole from Kenmare, North Dakota, succeeds Miss Whipple as instructor in English. Miss Cole was graduated from University of North Dakota with degree of A.B.

The last week of the summer course in Engineering 1–C was conducted in camp. There were forty-three students in the class. Dr. Alexander Gordon and Mr. Agapito Muyargas, graduate assistant, were in charge of the work. The first camp was near College Station and the second near the School of Forestry. The principal work was survey of the College Experiment Station.

The work closed with a *lechonada* celebration to which Dean Gonzalez and eight Co-eds were invited.

Mr. Catalino Acosta, member of Senior Class 1928, but completing work *ad interim* is teaching in Batac Farm School, Batac, Ilocos Norte.

Eladio Francisco, son of Gregorio Francisco, B.S. '17, is registered in the preparatory course this year. This young man has the distinction of being the first son of a College of Agriculture graduate to register in the College. Age is creeping on our institution.